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insectivorous species. Dr. Beal heads the list of beneficial birds of the forest with "The Woodpeckers", as taking the lead in the well-fare of tree life. The first colored plate shown of this group, is of a Red-headed Woodpecker at the end of a dead stub, a big brown and yellow-edged grasshopper in its bill ready for the gaping mouth of a young bird humped up on the other side of the stub, in all anxiety and expectation of that hopper. It is the most happy thought for a plate, of the sixteen bird groups, all by that great bird delineator of the present day Louis Agassiz Fuertes. Other plates show the Northern Hairy, White-backed Three-toed and Black-backed Three-toed Woodpeckers, the Yellow-bellied Sapsucker, and male Flicker. Dr. Beal also mentions that the Warblers, Vireos, Chickadees, Creepers, Cuckoos, Orioles, Robins, Kinglets, Pine Grosbeaks, Crossbills, Crows, and Blue Jays, all play an important part as conservors of the forest. Crows, Blue Jays, Crossbills and many of the Woodpeckers perform a great part, in the planting of tree seeds, which replenish the forests. Birds of prey are also shown to be of some benefit by keeping down the many smaller mammals so destructive to young tree growth.

In the concluding article, "The Wild Fowl of the St. Lawrence River", by J. W. Dunham, are shown three colored plates by Fuertes, of the Hooded Merganser, Pintail and Golden-Eye; there are also nine half-tone plates of nests and birds from life. Mr. Dunham gives an account of the water fowl's habits, as they occur on the St. Lawrence River, and mentions such restriction as should be made to protect them and other game of this river once so famed for its wild fowl.—W. O. E.

The Bulletin of the Illinois State Laboratory of Natural History for April, 1907, pp. 305-335, contains a very novel article by S. A. FORBES, Ph. D., which is entitled, "AN ORNITHOLOGICAL CROSS-SECTION OF ILLINOIS IN AUTUMN."

The paper deals with the science of ecology, or the relations of organisms to their environment, animate or inanimate. At the outset the two terms, special ecology and general ecology, are discriminated between, special ecology being the ecology of *one* species, while general ecology is the study of the ecology of a whole assemblage of species. Most work previously carried on in this line has dealt with special ecology. This article is given up to a discussion of the general phase of the study in a truly original manner.

There has been carried on in the past, by the Biological Survey and by various other laboratories, considerable study of the food habits of various species of birds. Dr. Forbes conclusively shows that the data in this line which has been accumulated is not practically

applicable until the *relative numbers* and *exact distribution* of each species are known.

Two students were sent out by the Illinois State Laboratory to traverse the state in various directions, keeping accurate account of the distance traveled, birds seen, and crop areas passed over. The trip considered in this paper was made across the state from east to west in a straight line, from Danville, near the Indiana line, to Quincy, on the Mississippi. The men traveled 50 yards apart for the whole distance, taking account of all birds seen within this strip and 100 yards in front of them. Crops of corn, wheat, clover, timothy, millet, fruit, and timber were passed thru, and some pasture, meadow, stubble, plowed ground, yard and swamp lands were included in the strip.

The most numerous bird was the English Sparrow, 1620 of the 4804 birds seen belonging to that species. In all, 92 species of birds were observed, altho 85 per cent of the individual birds seen belonged to 15 species.

The bulk of the paper consists of tables of numerical facts, worked out from the data furnished by the two field observers. In these tables every possible relation of each species of bird to every other and to the various crops is taken into account.

In point of area corn was the principal crop, with the area in pasture land and stubblefield coming next.

From the tables it is apparent that the English Sparrow was the principal corn-field species; the Meadow Lark was most abundant in stubble fields and fields of young wheat; in pasture land the English Sparrow was the commonest, with the Crow-blackbird a close second; the Meadow Lark and Cowbird were equally abundant in meadows; Horned Larks were most numerous on plowed ground; while the ever-present English Sparrow was most numerous in orchards.

By taking the ratio of the birds found in a particular crop to the whole number of birds as a dividend, and the ratio of the area in that crop to the entire area as a divisor, the *frequency ratio* of the bird and crop in question is found. Then by dividing the frequency ratios of a species for each crop by its frequency ratios for all the other crops, the *coefficients of preference* are obtained.

The article closes with a table of the 92 species identified, with the numbers of each. It is characterized throughout by the mathematical precision with which the observed facts have been recorded. A new and instructive line of work is opened. It would certainly seem that the true ecological significance of the birds of a community could be gotten at in no surer or simpler way than this. In place of general inferences, results have been actually figured out, accurately and graphically.—WALTER P. TAYLOR.